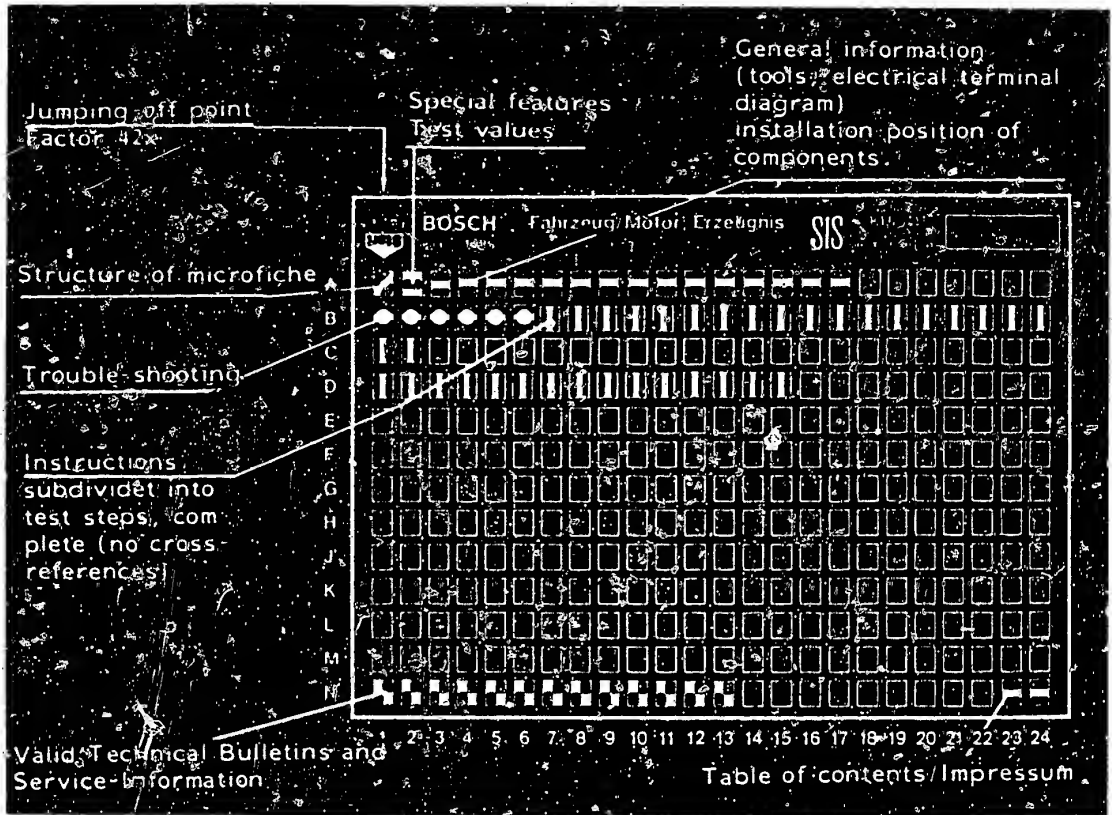


Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

E 16	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section



Beginning



Mid-section



End



One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

C6

A1

Trouble-shooting program



1. Special features

Vehicles are equipped with:

trigger box	0 227 100 124 (with current limitation)
ignition coil	1 227 020 009
timing-advance unit	0 227 921 021

2. Test specifications

Ignition coil, primary 0.6 ... 1.0 Ω

B9

Ignition coil, secondary 6.4 ... 11.1 k Ω

Basic ignition setting with 10° BTDC
engine idling and engine oil
at approx. + 80° C

B15

Voltage supply 12...14V
Trigger box
with engine idling

B23

Voltage supply $\geq 10V$
Ignition coil
with engine idling

Primary voltage 295...365V
with engine idling

C1

Voltage supply $\geq 10V$
Magnetic pulse generator

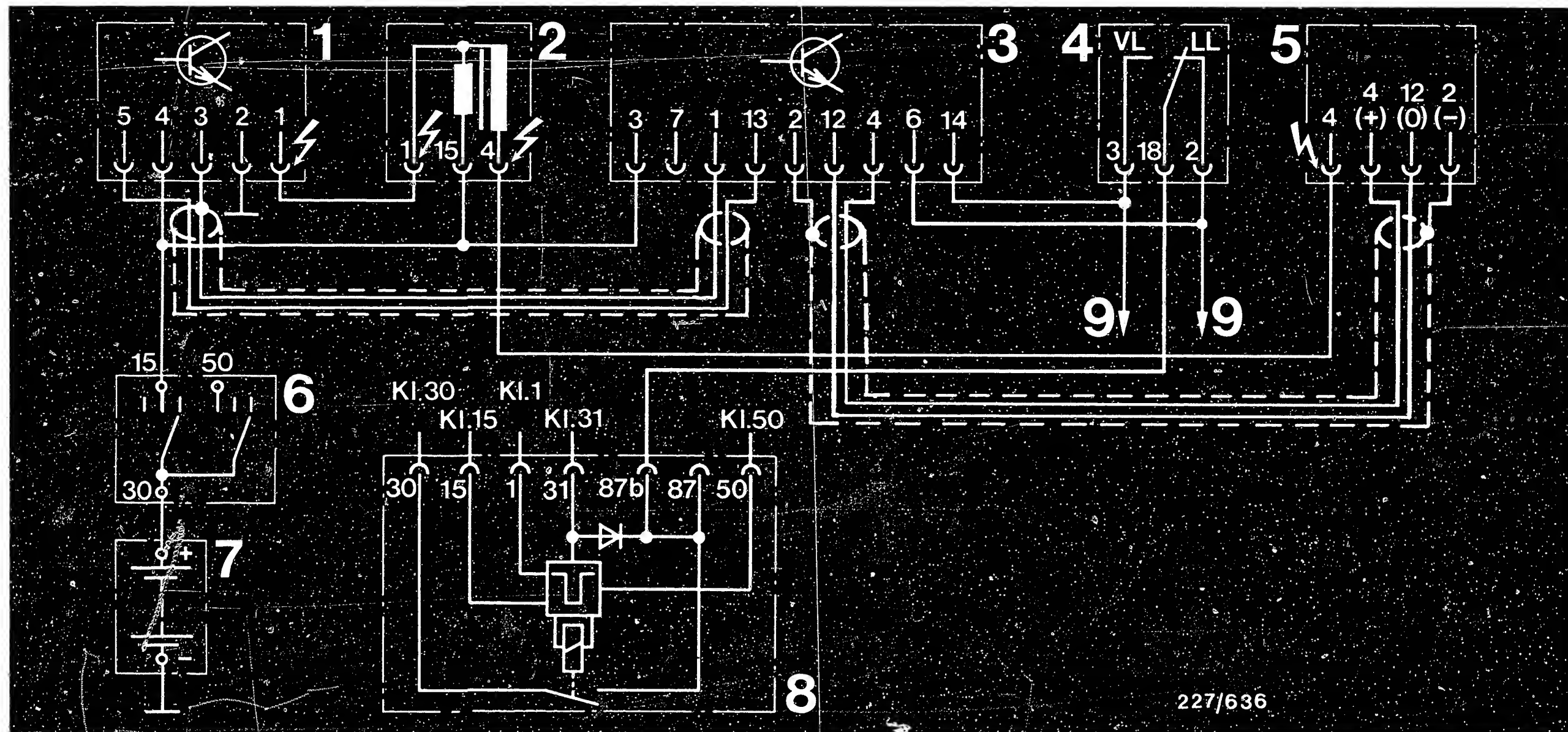
D4

See Autodata test specifications for setting values
for ignition, exhaust gas, valve play, etc.

A2

Special features, test specifications
Opel





High-voltage arrows:
Caution, 400V...25 kV

- 1 = Trigger box
- 2 = Ignition coil
- 3 = Spark advance mechanism

- 4 = Throttle valve switch
- 5 = Ignition distributor
- 6 = Ignition-starter switch

- 7 = Battery
- 8 = Control relay for L-Jetronic
- 9 = To L-Jetronic

3. Electrical terminal diagram

The dangerous locations are marked with danger arrows, taking the example of the terminal diagram of an electronic ignition system.

A3

Electrical terminal diagram

Opel



A4

Electrical terminal diagram

Opel



4. Installation position of components

The trigger box and ignition coil are mounted on a common heat sink. See upper illustration.

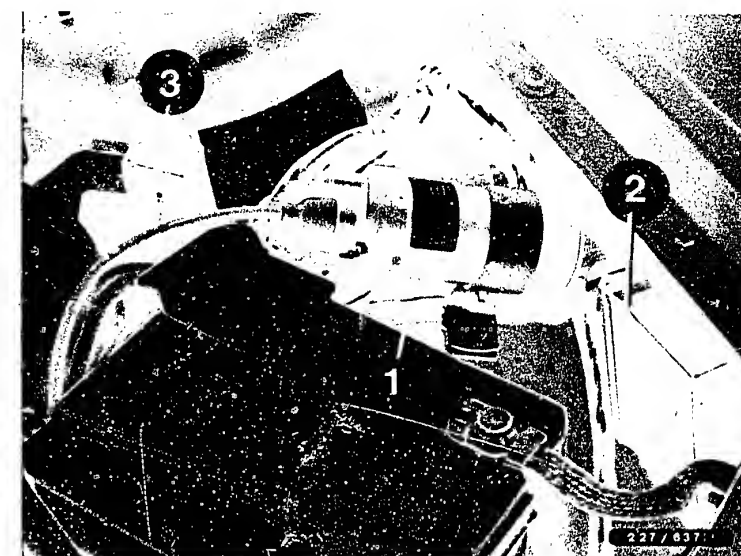
The spark advance mechanism is located next to the ignition coil. See upper illustration.

Note on removal:

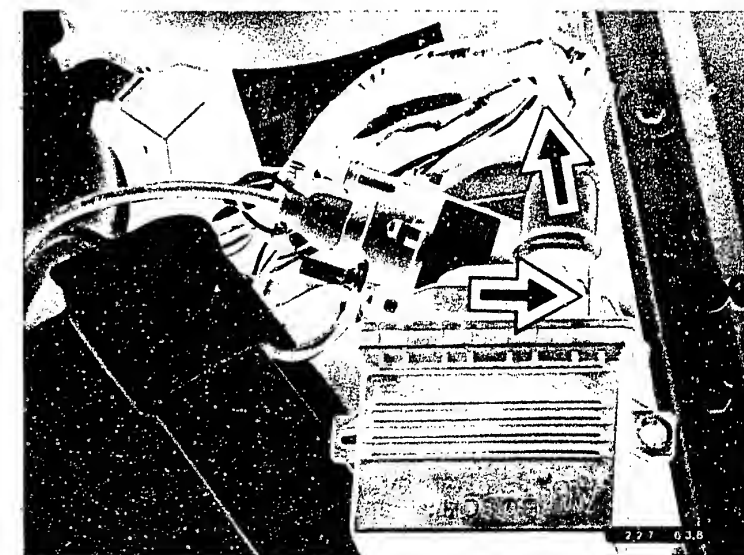
in order to allow the spark advance mechanism plug to be disconnected, the spark advance mechanism must be removed.

Press the detent for the spark advance mechanism plug in the direction of the arrow, and then turn the plug in the direction of the arrow. See lower illustration.

The L-Jetronic control relay is located next to the ignition coil. See upper illustration.



- 1 = trigger box
- 2 = spark advance mechanism
- 3 = L-Jetronic control relay



A5

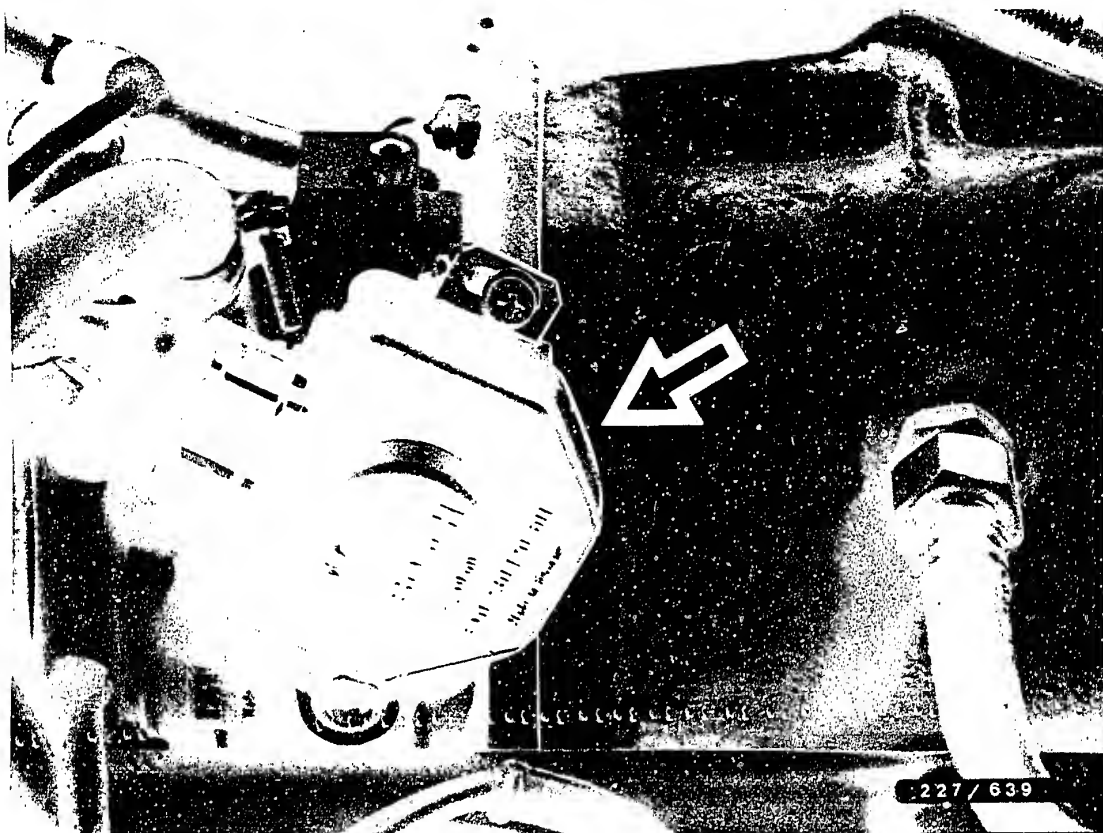
Installation position of components
Opel



A6

Installation position of components
Opel





Arrow = Throttle-valve switch

A7

Installation position of components

Open



5. Necessary test equipment, aids

Motortester e.g.	MOT 201	0 684 000 201
Pulse shaper (required to measure the primary voltage with MOT 200, 201, 202 and 400)		1 684 463 154
Spark gap e.g.	EFAW 106A	0 681 100 001
ignition coil and condenser tester or single spark gap	EF 1177/7	1 684 531 000
5k Ω sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e.g.	Pontavi Wh2	Commercially available
Voltmeter e.g.	ETE 014.00	0 684 101 400
Heat-conducting paste		5 942 860 003
Short-circuit device (for basic ignition setting)		KDZS 0003
Connecting cable for ignition coil (for terminal 1, green)		1 684 443 055
Connecting cable for ignition coil (for terminal 15, yellow)		1 684 443 054
Test leads (for correct connection of test equipment to connectors)		KDYS 0004
Test prods (for correct connection of test equipment to connectors)		Commercially available



6. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts of terminals are touched (both on the primary as well as the secondary sides).

In this connection we should like to point out that the VDE regulations, in particular VDE 0104/1.87 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc.).



If, while testing the ignition system or during adjustment work on the engine (e. g. L-Jetronic) , it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

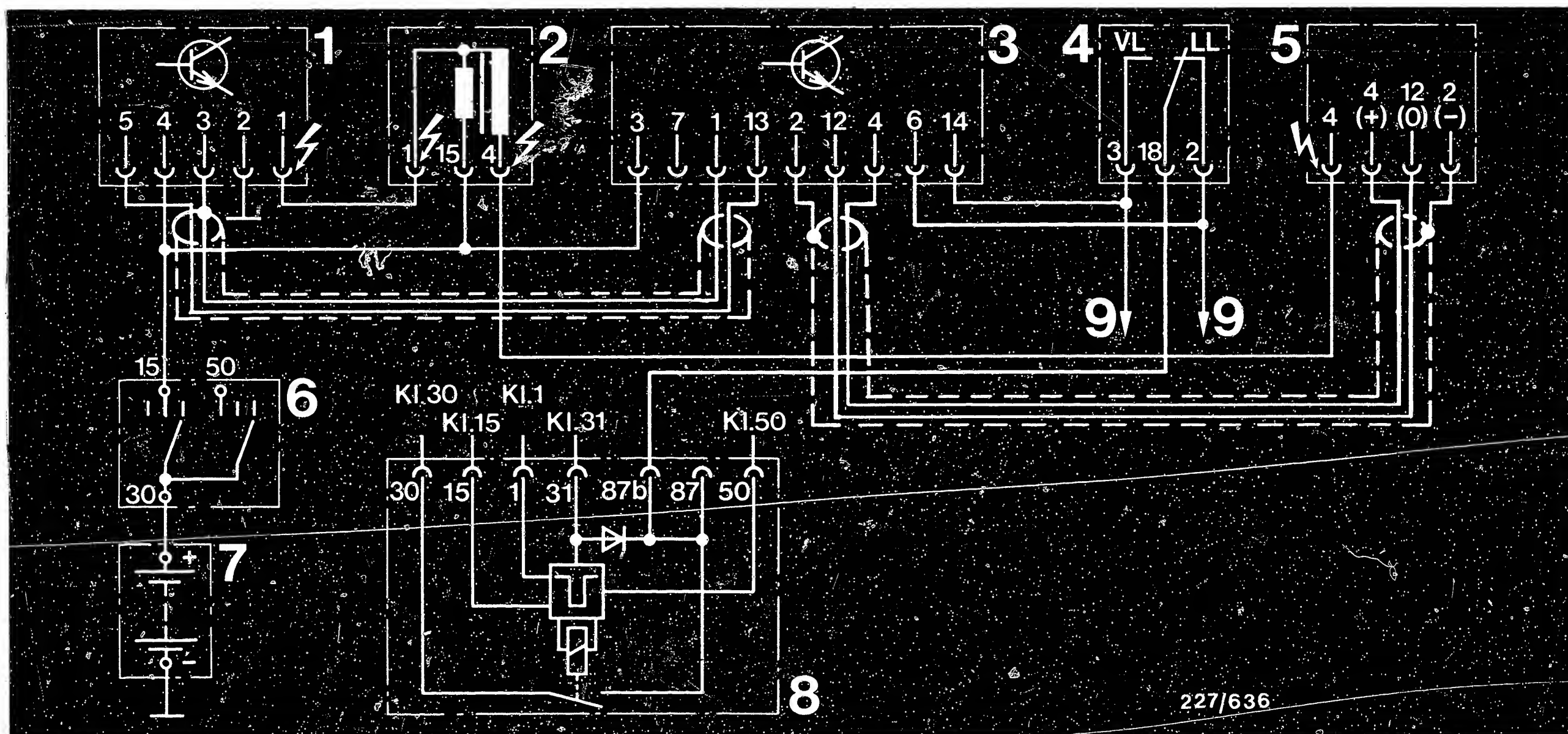
The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e. g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e. g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.

A10

Danger of accident

Opel





High-voltage arrows:
Caution, 400V...25 kV

1 = Trigger box
2 = Ignition coil
3 = Spark advance mechanism

4 = Throttle valve switch
5 = Ignition distributor
6 = Ignition-starter switch

7 = Battery
8 = Control relay for L-Jetronic
9 = To L-Jetronic

The dangerous locations are identified by danger arrows taking the example of the terminal diagram of an electronic ignition system.

A11

Danger of accident

Open



A12

Danger of accident

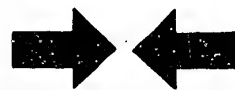
Open



7. Incorrect indication of engine speed, dwell angle
and ignition point

In ignition systems with trigger box 0 227 100 124
(TZ) with current limitation there may be an incorrect
indication of engine speed, dwell angle and ignition
point on testers.

For further details see coordinates N 8 - N 12.



8. Important vehicle information

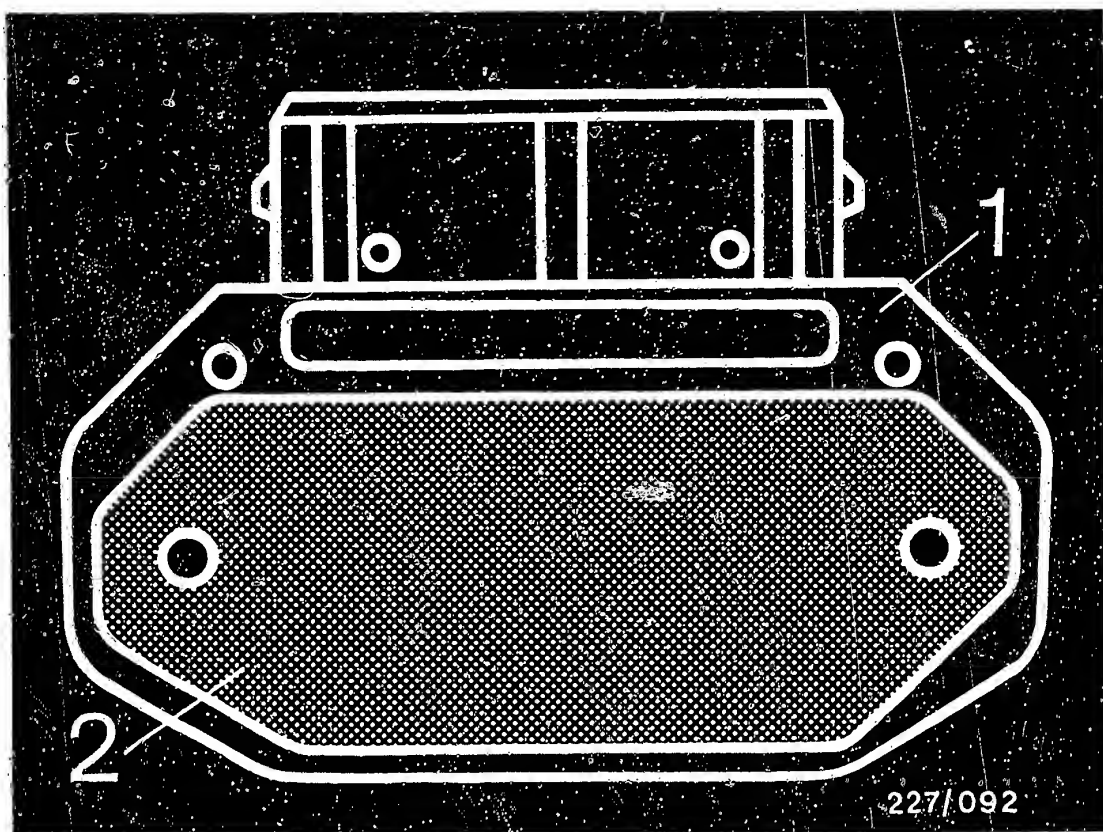
- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).
- During the compression test, either pull off the trigger-box plug or f i r m l y connect terminal 4 of the ignition coil to ground using an extra cable (dangerous voltages, insulation damage at ignition coil, ignition distributor, ignition harness).

Note:

Auxiliary cables must be suppressed with at least $2k\Omega$ e.g. sleeve-type suppressor ($5k\Omega$) 0 356 500 001.

- The specified ignition coil. (see Part.No.) must not be replaced with a different ignition coil.
- No suppression capacitor must be connected to ignition coil terminal 1 and terminal 15.
- Ignition coil terminal 1 must not be brought into contact with ground as a theft-proofing measure (ignition coil will be destroyed when ignition is switched on).
- No battery + or test lamp must be connected to ignition coil terminal 1 (trigger box will be destroyed).
- Ignition cable from ignition coil terminal 4 to ignition distributor terminal 4 must not be disconnected during operation.
- There must be no arcing from ignition coil terminal 4 to ignition coil terminal 1 and 15. The magnetic pick-up assembly and trigger box may be destroyed.



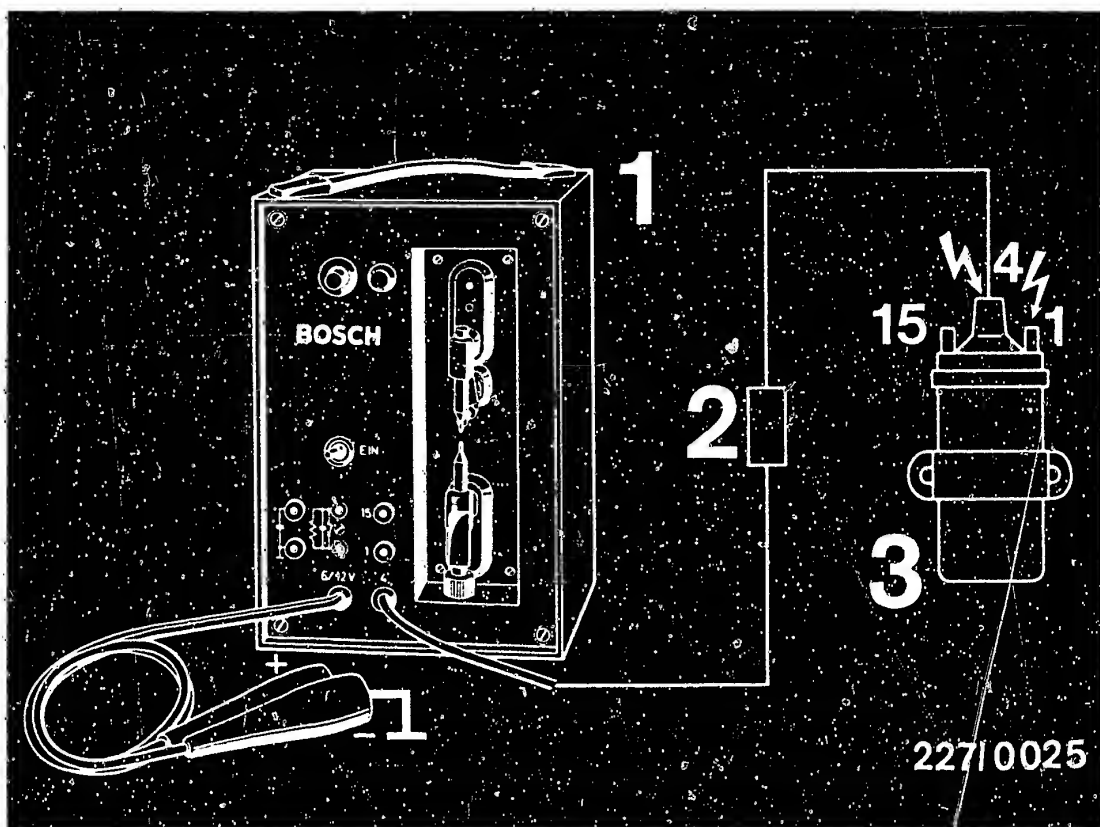


1 = Trigger box

2 = Base plate

- Before mounting the trigger box, the base plate must be coated with thermal conduction paste. Apply thermal conduction paste only with a suitable object (screwdriver, matchstick etc.)

Do not apply thermal conduction paste to painted parts.



- 1 = Spark gap
- 2 = 5 k Ω sleeve-type suppressor
- 3 = Ignition coil

High-voltage arrows:
Caution, 400V...25 kV

- In order to prevent the trigger box from being irreparably damaged, when using a spark gap, an interference-suppression resistor of at least 2 k Ω must be connected between the spark gap and ignition coil terminal 4, e. g. sleeve-type suppressor (5 k Ω) 0 356 500 001.

- In order to prevent the trigger box from being irreparably damaged, the secondary side of the ignition system must have at least 2 k Ω interference suppression whereby the original distributor rotor with 1 k Ω interference-suppression resistor must be fitted (even in the case of radio and spark interference suppression do not use a 5 k Ω distributor rotor).
- No external voltage, e. g. ohmmeter, must be connected to the ignition distributor magnetic pickup assembly (Hall generator).

Caution when switching over measuring ranges.

- The line from the Hall generator to the ignition timing unit and from the ignition timing unit to the trigger box must be shielded (malfunction of ignition timing unit/trigger box).
- Arcing or breakdown of insulation at the distributor cap (poor insulation) may lead to the destruction of the magnetic pickup assembly and trigger box.
- Do not disconnect the battery while the engine is running.
- Incorrect battery polarity will lead to the destruction of the magnetic pickup assembly of the ignition distributor, trigger box and ignition coil as well as ignition timing unit.
- Do not use a starting aid with more than 16 V or a fast charger for starting.



9. Trouble-shooting

9.1 Procedure - trouble-shooting chart

The trouble-shooting chart starting on Coordinate B 3 contains customer complaint (fault symptoms), cause of trouble, test instructions and coordinate reference.

The possible cause of the fault should be selected from the trouble-shooting chart in accordance with the customer complaint. (fault symptom).

If the cause of the fault is not clear, start testing with the detailed, self-contained trouble-shooting program beginning on Coordinate B 7.

If the cause of the fault is clear from the trouble-shooting chart, direct trouble-shooting is possible by going to the stated coordinate without having to perform the entire trouble-shooting program for each fault.

If there is no coordinate reference, trouble-shooting must be performed in accordance with the "Test instructions" column.

9.2 Procedure - trouble-shooting program

The trouble-shooting program starting on Coordinate B 7 is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.

The center row contains repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanations of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "yes", then proceed to the next test down.

9.3 Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e. g. compression, valve clearance etc.). Ambient temperature/ignition system temperature 0° to 100° C (temperature has a considerable effect on measured values).

B1

Trouble-shooting

Opel



B2

Trouble-shooting

Opel



9.4 Trouble-shooting chart

Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

8. Backfiring

9. Engine becomes too hot

									Cause of trouble	Test instructions	Coordinates
●	●	●	●	●	●	●	●	●	Unclear	Perform detailed trouble-shooting	B 7
●	●	●	●	●	●		●		Spark plugs defective	Evaluation by means of ignition oscilloscope, or visual examination of removed spark plug	-----
●	●	●	●	●					Shunt on secondary side	Evaluation of ignition coil, ignition distributor, ignition harness and spark plug by means of ignition oscilloscope or visual examination	-----
●	●	●	●	●					Open circuit on secondary side	Evaluation of ignition coil, ignition distributor, ignition harness and spark plug by means of ignition oscilloscope, or continuity test with ohmmeter	-----
●									Open circuit on primary side	---	D 1
●	●	●	●	●					Ignition coil defective	---	B 9
		●	●	●	●				Interference-suppression resistors defective	Evaluation by means of ignition oscilloscope or resistance measurement	-----

B3

Trouble-shooting chart

Opel



B4

Trouble-shooting chart

Opel



Trouble-shooting chart

Customer complaint (symptom of trouble)

1. Starting motor operates, but engine fails to start
2. Rough idling
3. Poor throttle response
4. Engine lacks power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine becomes too hot

									<u>Cause of trouble</u>	<u>Test instructions</u>	<u>Coordinates</u>
●	●	●	●	●	●	●	●	●	Basic ignition setting incorrect	-	B 15
		●	●		●	●		●	Vacuum advance defective	See Autodata test specifications	-
			●		●				Throttle valve switch defective	-	B 17
	●	●	●	●	●				Trigger box defective	-	C 1
●									Voltage supply of trigger box defective	-	D 1
●									Magnetic pulse generator defective	-	D 4
●									Spark advance mechanism defective	-	D 8
●							●		Firing sequence incorrect	See Autodata test specifications	-

B5

Trouble-shooting chart

Opel



B6

Trouble-shooting chart

Opel



9.5 Trouble-shooting program

Test primary signal. If no oscilloscope or tachometer available, check whether ignition spark across spark gap.

Primary signal testing with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions.

Start engine.

Oscilloscope must indicate a primary voltage (of any value).

Primary signal testing with tachometer

Connect tachometer to ignition coil as per operating instructions.

Start engine.

Tachometer must indicate a reading (of any value).

Ignition spark testing with spark gap

Remove H.T. igniton cable terminal 4 from ignition coil.

Connect spark gap including sleeve-type suppressor (5 k Ω) to ignition coil.

Adjust spark gap to 5 mm.

Start engine.

There must be sparks across the spark gap.

Primary signal present or ignition sparks across spark gap?

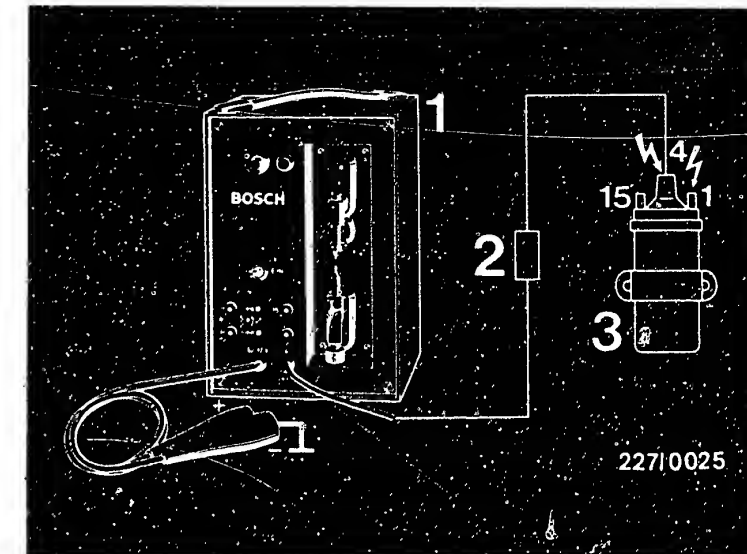
no

If no primary signal or no ignition spark, continue testing at D 1.

Tests from B 9 onwards not necessary.

yes

Continued on B9/B10



1 = Spark gap

2 = 5 k Ω sleeve-type suppressor

3 = ignition coil

High-voltage arrows:
Caution, 400V...25 kV

B7

Trouble-shooting program

Opel

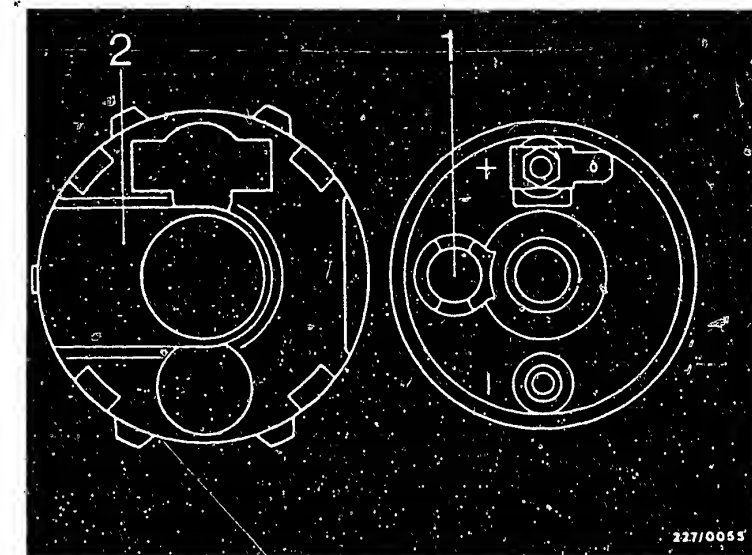
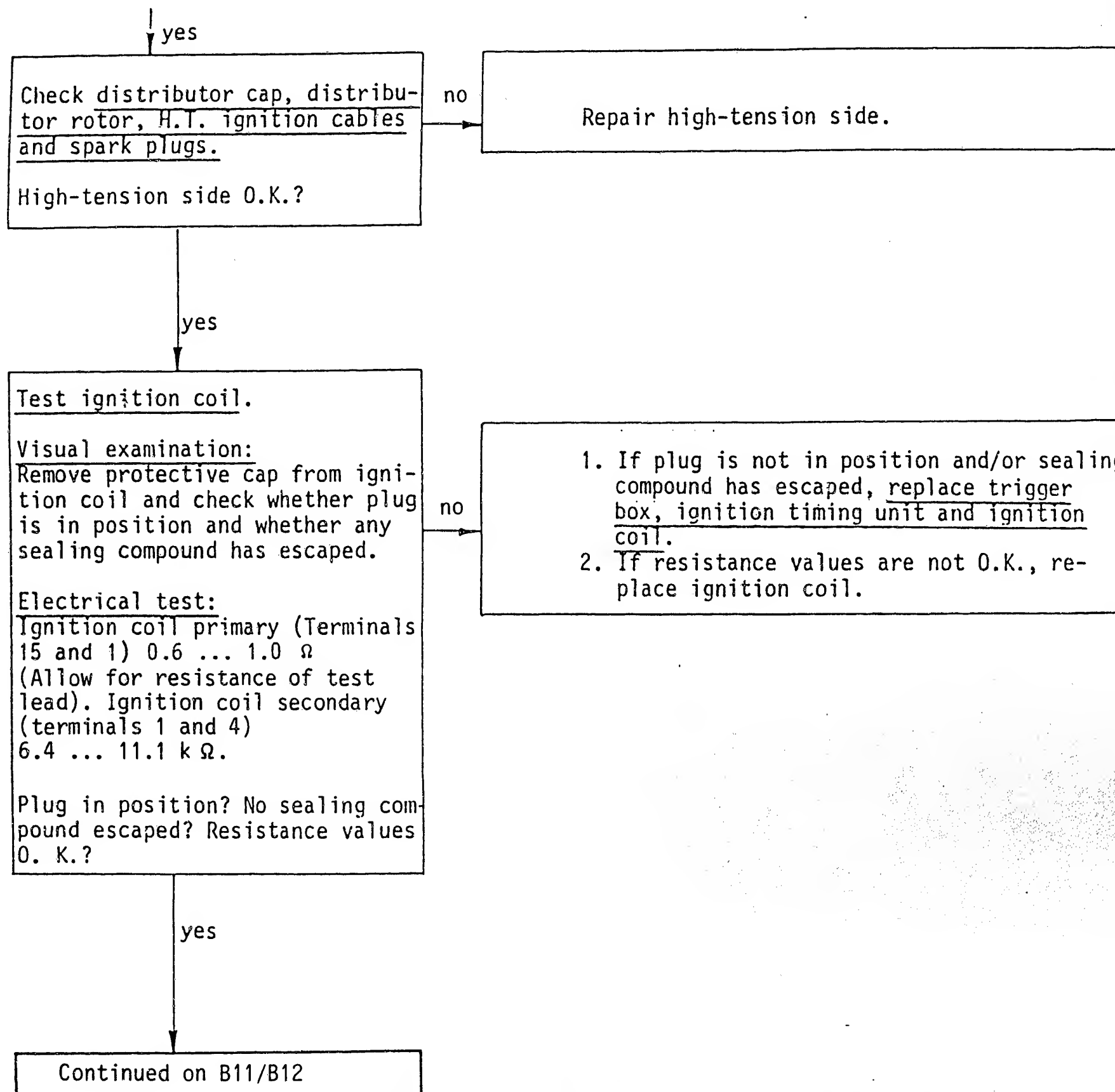


B8

Trouble-shooting program

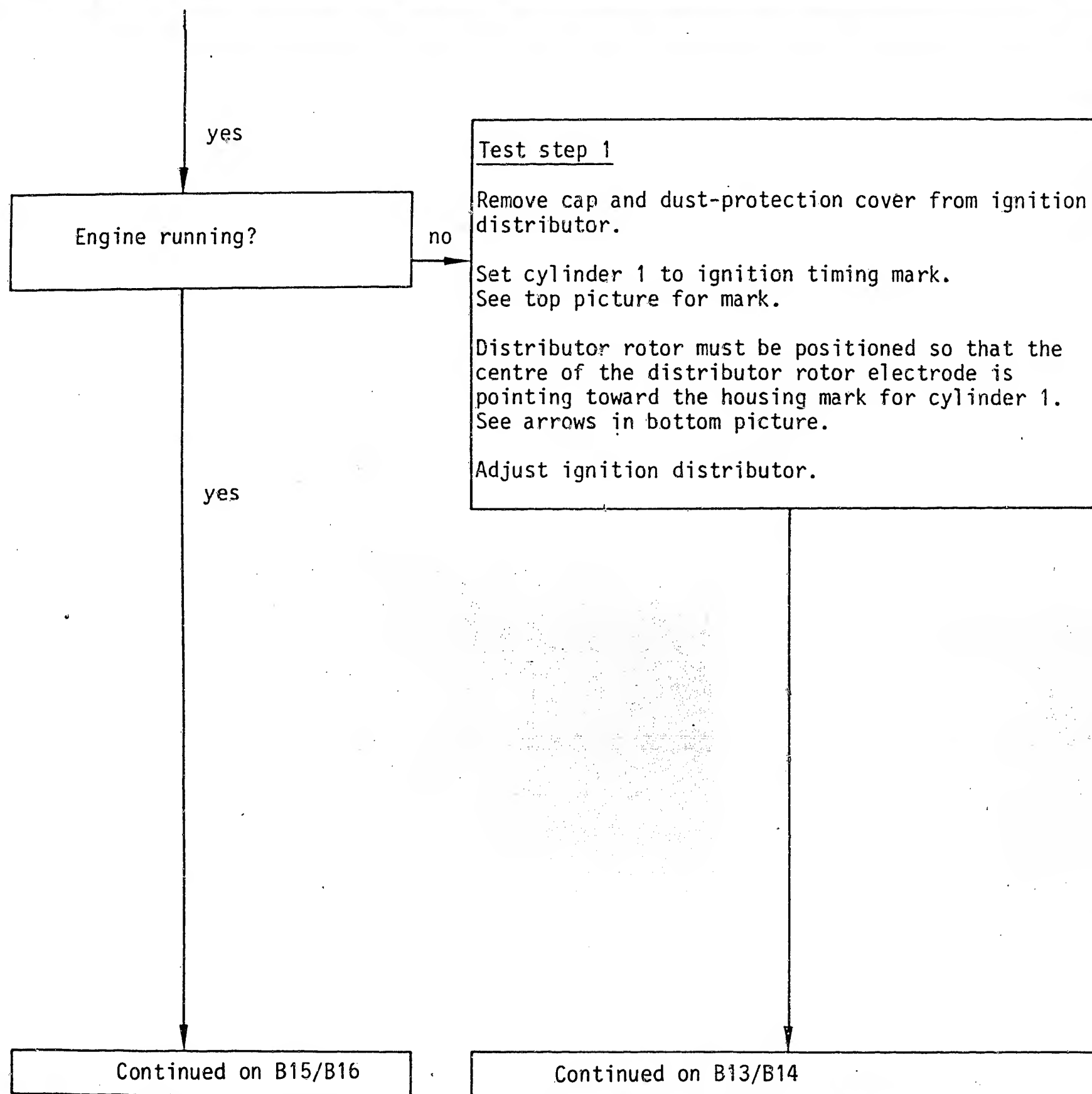
Opel





1 = Plug
2 = Protective cap





Ignition timing mark
(10° BTDC)



B11

Trouble-shooting program

Opel



B12

Trouble-shooting program

Opel



Continued

2. Test step

Disconnect the negative and positive leads from the battery. Press down the securing clip of the trigger box plug and disconnect the plug. Switch on the ignition.

1. Check for contact resistance in cable from positive battery terminal to trigger box plug term.4 including cables from negative battery terminal to trigger box plug. term.2. Total contact resistance max. 0.3Ω (allow for resistance of test lead).

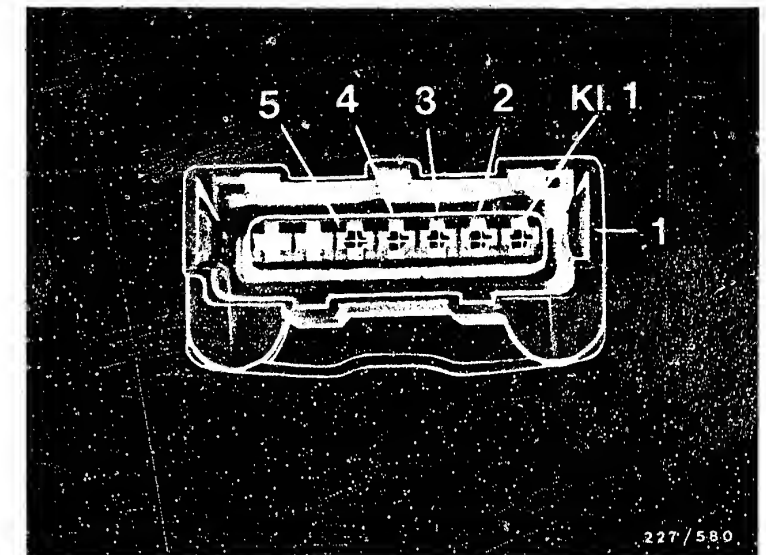
Eliminate contact resistance.

2. Check for contact resistance in cables from positive battery terminal to ignition coil term.15 as well as in cable from ignition coil term.1 to trigger box plug term.1. Total contact resistance max. 0.3Ω (allow for resistance of test lead).
Eliminate contact resistance

If test steps 1 and 2 do not reveal fault, replace trigger box.

yes

Continued on B15/B16



1 = Trigger box plug

B13

Trouble-shooting program

Opel



B14

Trouble-shooting program

Opel



yes

Check basic ignition timing. (If indication of engine speed on tester is clearly incorrect, connect a series resistor into the circuit).
Bring the engine to its normal operating temperature (engine oil approx. +80° C).

Disconnect the plug from the throttle valve switch and fit a short-circuit device KDZS 0003 to the disconnected plug. See upper illustration.

Disconnect the hose from the ignition distributor vacuum unit. Let engine idle. View the timing mark with a stroboscope. The mark on the crankshaft pulley must align with the pointer on the timing case. The mark corresponds to 10° BTDC. See arrow in lower illustration.

Check; Let engine run at approx. 2000 min⁻¹. The timing mark must still be in alignment. Basic setting incorrect?

yes

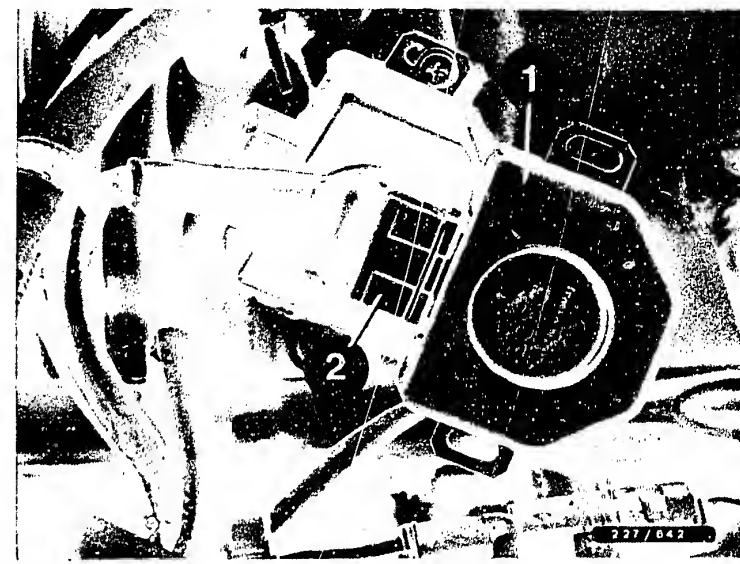
Remove short-circuit device KDZS 0003 from throttle valve switch plug.
Reconnect plug to throttle valve switch.

yes

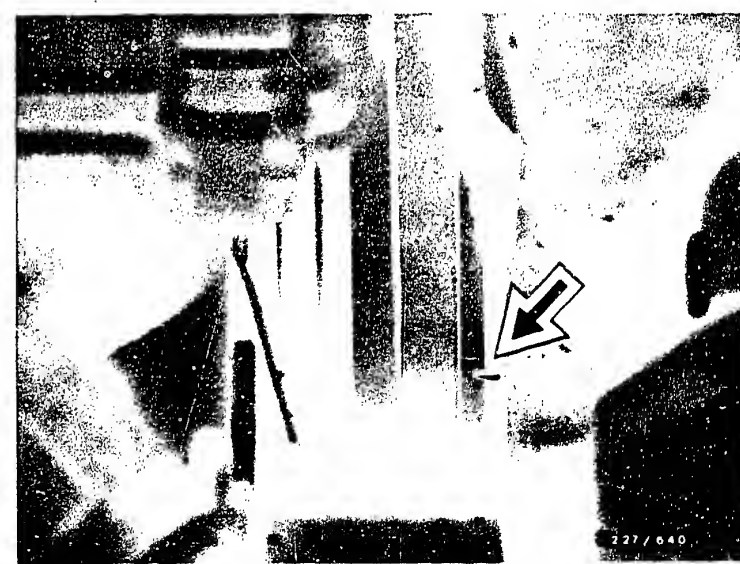
Continued on B17/B18

no

Loosen ignition distributor clamp and turn ignition distributor until marks coincide (10° BTDC)



1 = Short-circuit device KDZS 0003
2 = Throttle valve switch plug



B 15

Trouble-shooting program

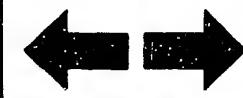
Open

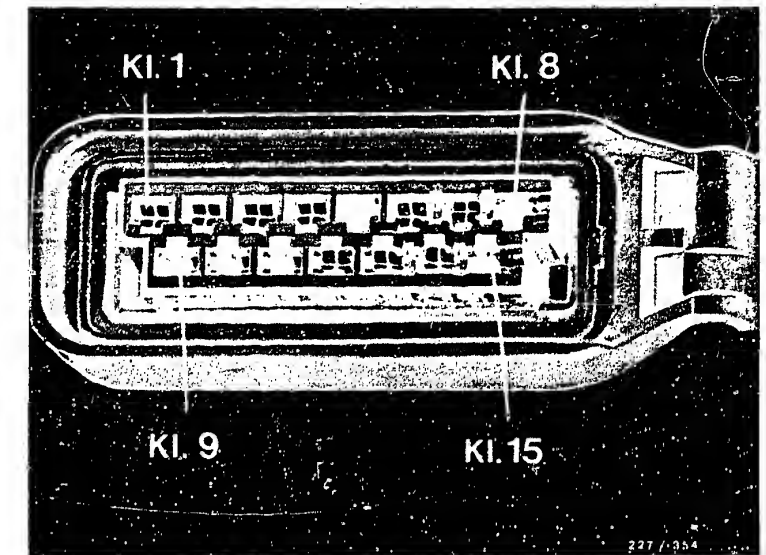
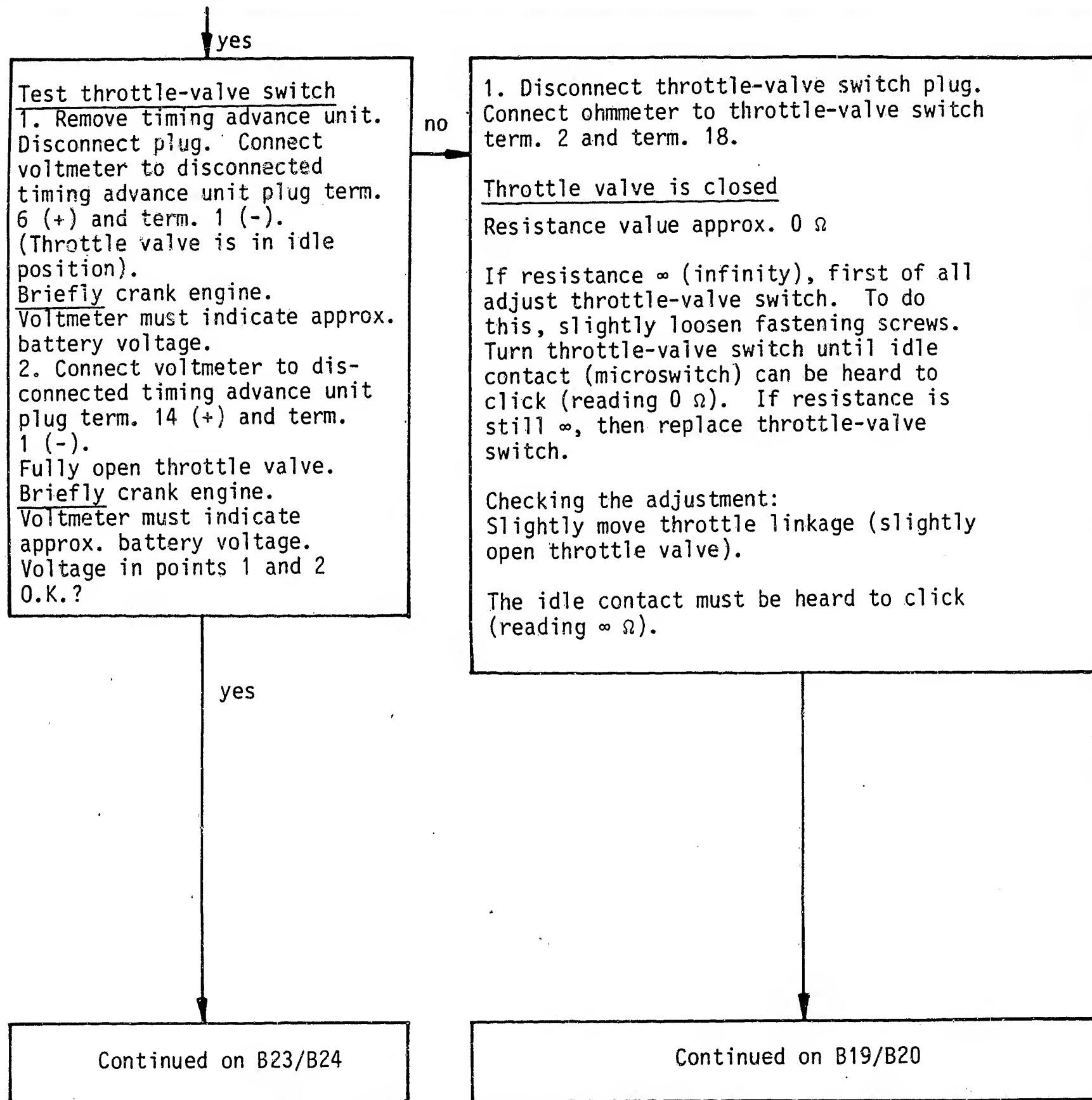


B 16

Trouble-shooting program

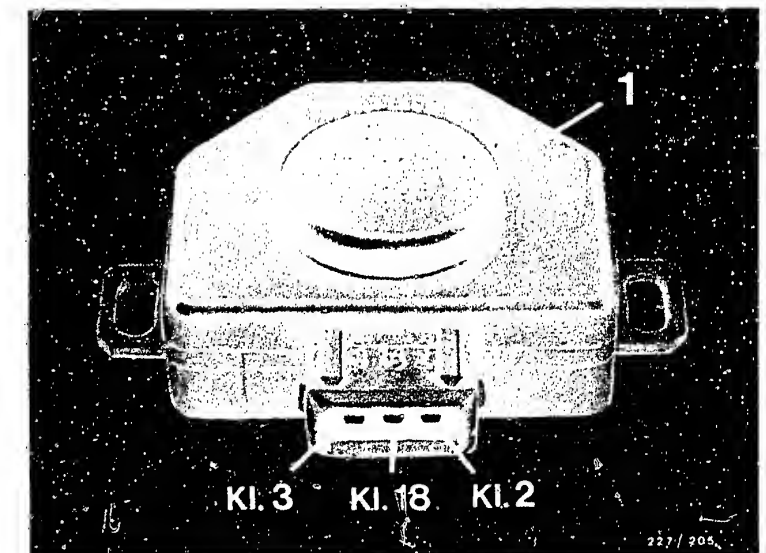
Open





Timing advance unit plug

1 = Throttle-valve switch



B17

Trouble-shooting program

Opel



B18

Trouble-shooting program

Opel



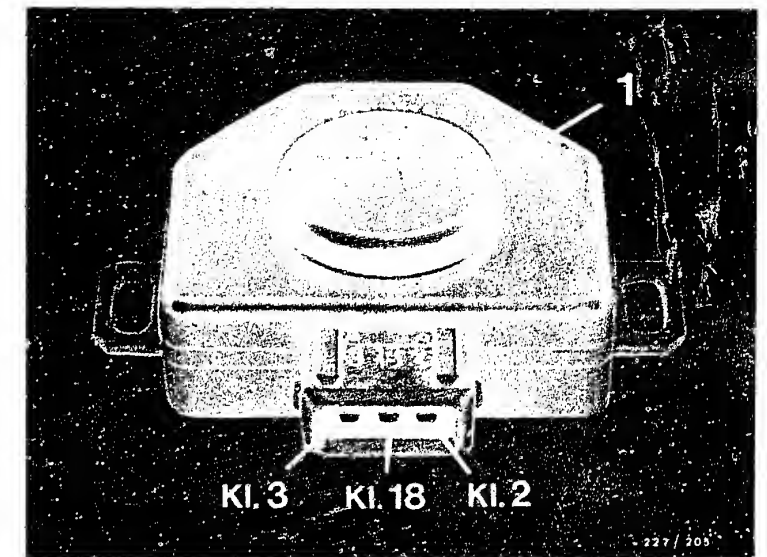
Continued

2. Connect ohmmeter to throttle-valve switch
term. 3 and term.18

Open throttle valve fully

Resistance approx. 0Ω

If resistance infinity (∞), replace throttle-
valve switch.



1 = Throttle-valve switch

yes

Continued on B23/B24

Continued on B21/B22

B 19

Trouble-shooting program

Open



B 20

Trouble-shooting program

Open

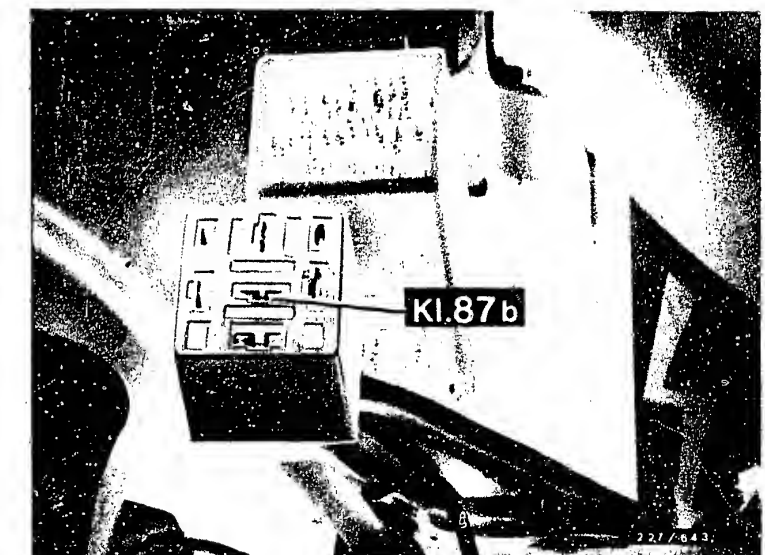
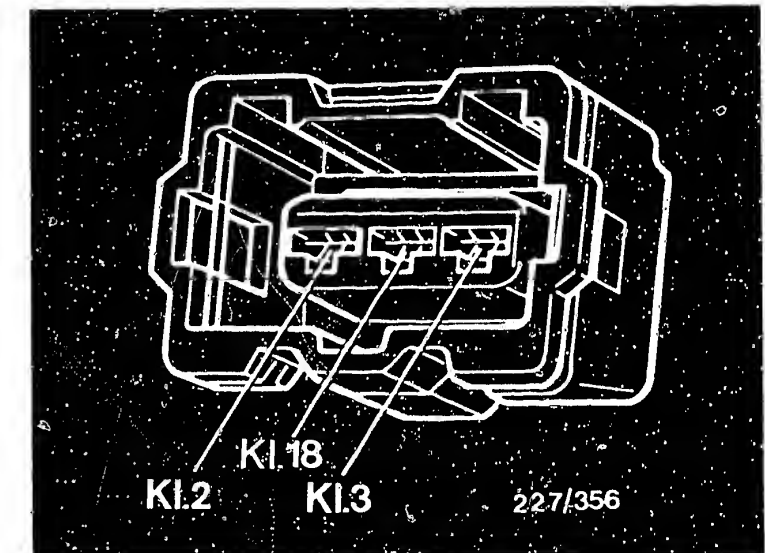
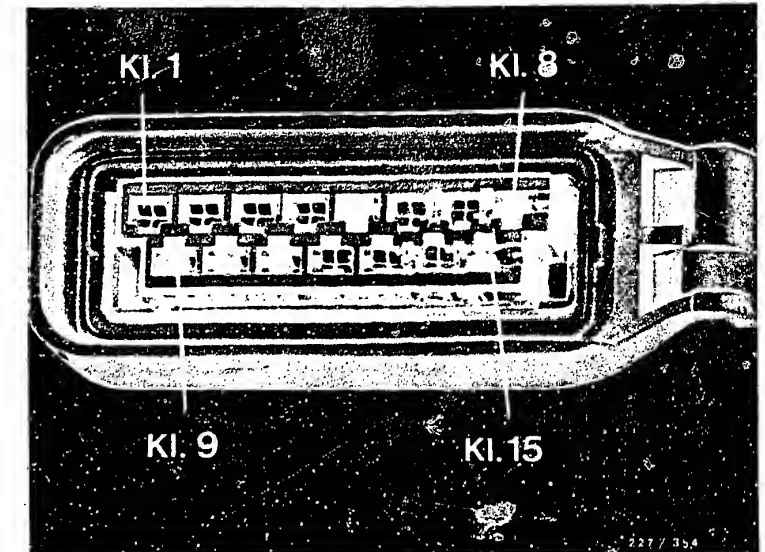


Continued

If approx. 0 Ω was measured in test steps 1 and 2, then test for open circuit in lead connection from timing advance unit plug term. 6 and term. 14 (see top picture) to throttle-valve switch plug term. 2 and term. 3 (see center picture) and in lead from throttle-valve switch plug term. 18 to L-Jetronic control-relay plug term. 87b (see bottom picture). Eliminate open circuit.

yes

Continued on B23/B24



B21

Trouble-shooting program

Open



B22

Trouble-shooting program

Open



yes

Test trigger box voltage supply.

Push back rubber sleeve of trigger box plug. See upper illustration. Connect voltmeter to trigger box plug term. 4 (+) and term. 2 (-). Let engine idle. The measured voltage must equal battery voltage, and must be no more than 1 V below battery voltage.

Voltage correct?

no

Disconnect negative and positive cables from battery. Remove trigger-box plug. Switch on ignition.

Check for contact resistance in cables from positive battery terminal to trigger-box plug term. 4 including cables from negative battery terminal to trigger-box plug term. 2. Total contact resistance max. 0.3 Ω (Allow for resistance of test lead).

Eliminate contact resistance.

yes

Test ignition coil voltage supply

Connect voltmeter to ignition coil term. 15 and negative battery terminal.

Allow engine to idle. Measured voltage must be at least 10 V.

Voltage correct?

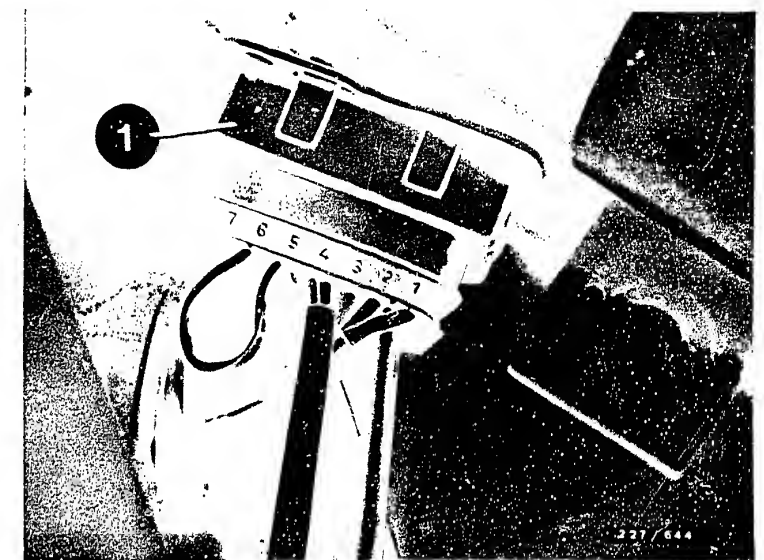
no

Disconnect positive cable from battery. Switch on ignition. Check for contact resistance in cables from positive battery terminal to ignition coil term. 15. Contact resistance max. 0.3 Ω . (Allow for resistance of test lead).

Eliminate contact resistance.

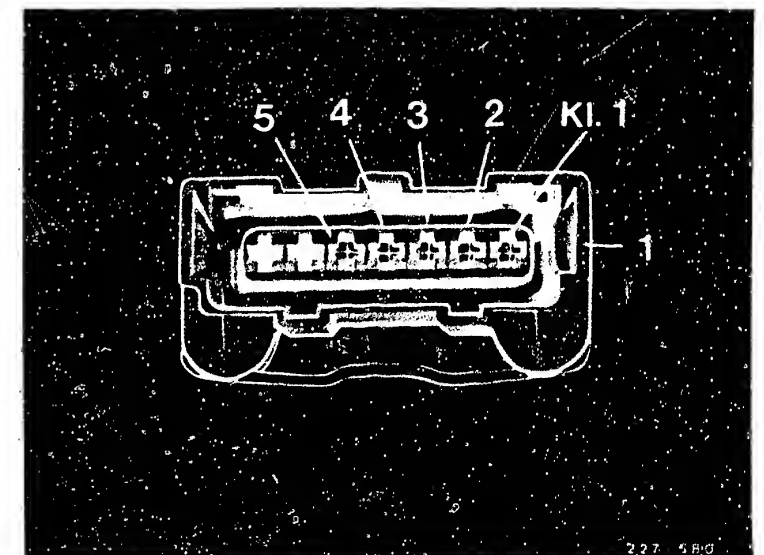
yes

Continued on C1/C2



1=Trigger-box plug

1=Trigger-box plug



B23

Trouble-shooting program

Opel



B24

Trouble-shooting program

Opel



yes
Check primary voltage

(Assuming MOT series available)

Connect an oscilloscope (e.g. MOT 201) and pulse shaper 1 684 463 154 to the ignition coil as per the operating instructions.

Note:

An incorrect measured value will be obtained without a pulse shaper.

Let the engine idle.

The measured primary voltage must be 295...365 V.

See illustration.

Voltage value correct?

no

Replace trigger box.

yes

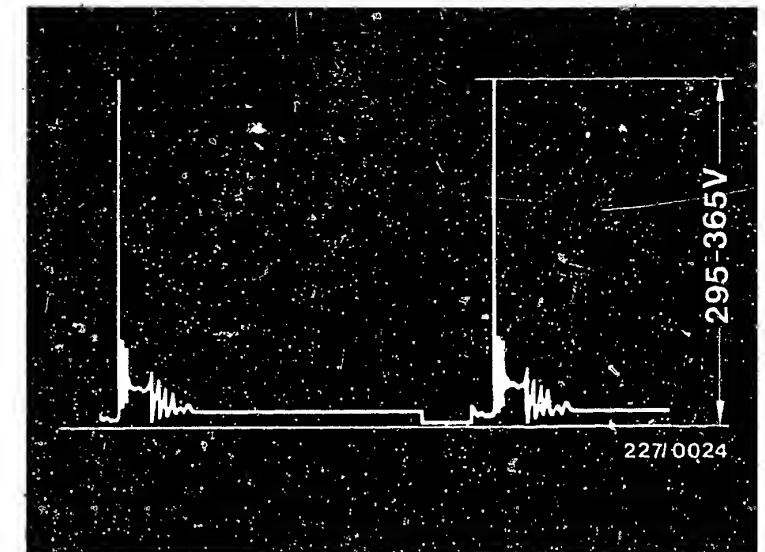
Ignition system in order

Test completed.

Test step starting at D 1 no longer necessary.

Note:

If customer complaint has not yet been eliminated, check for possible faults in the fuel system or mechanical faults on engine.



C1

Trouble-shooting program

Opel



C2

Trouble-shooting program

Opel



No primary signal/no ignition spark
(Continued from B7/B8).

yes

Test trigger-box voltage supply.
Press back the retaining clip of the trigger box plug, and disconnect the plug.
Connect voltmeter to trigger-box plug between term. 4 (+) and term. 2 (-).
Switch on ignition.
Voltmeter must indicate battery voltage..

no

Check for open circuit in cables and terminals from ignition and starting switch to trigger-box plug term. 4 including ground cable term. 2.
Eliminate open circuit.

yes

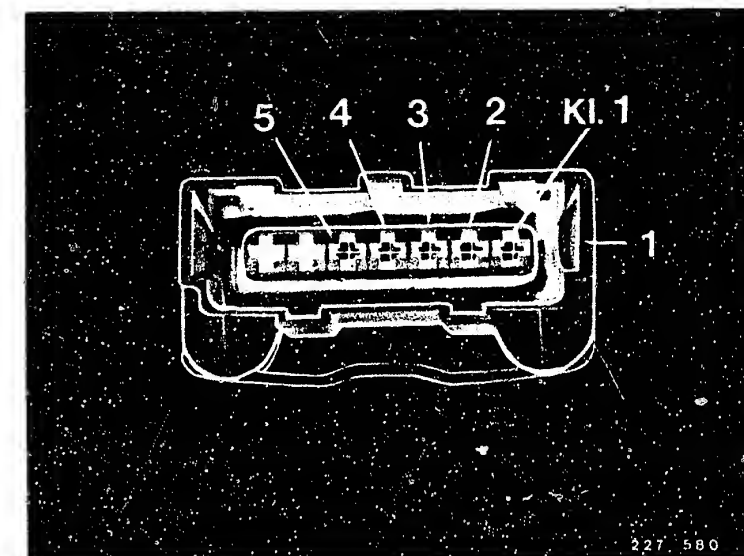
Test primary circuit.
Connect voltmeter to disconnected trigger-box plug between term. 1 (+) and term. 2 (-).
Switch on ignition.
Voltmeter must indicate battery voltage.
Voltage correct?

no

Check for open circuit in cable from ignition and starting switch to ignition coil term. 15, in the primary winding of the ignition coil, in the cable from ignition coil term. 1 to trigger-box plug term. 1 and in the ground cable term. 2.
Eliminate open circuit.

yes

Continued on D3/D4



1=Trigger-box plug

D1

Trouble-shooting program

Open



D2

Trouble-shooting program

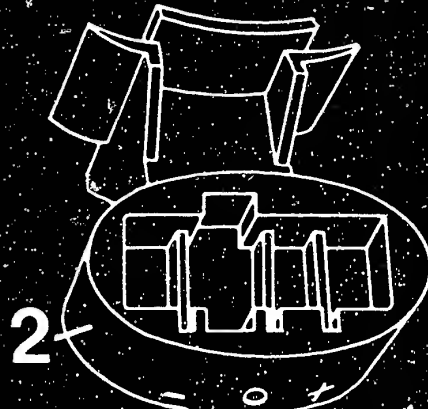
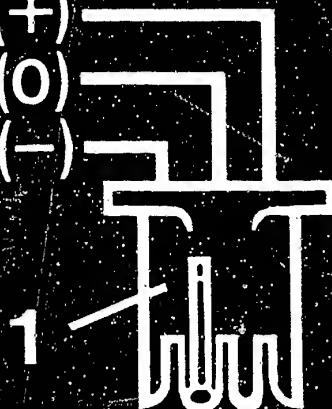
Open



Kl. 4(+)

Kl. 12(0)

Kl. 2(-)



227/357

- 1 = Ignition-distributor connector
- 2 = Ignition-distributor socket

yes

Test connector and socket of ignition distributor.

Visual examination:

Remove the ignition-distributor connector (see picture) and check contacts for oxidation and correct latching (remedy defects).

Reconnect ignition-distributor connector. If customer complaint not remedied, continue testing.

yes

Continued on D 4 / D 5



yes

Test pulse generator voltage supply.

Plug on trigger-box plug. Push back rubber sleeve of ignition-distributor connector.

Connect voltmeter with test prods to ignition distributor plug term. 4 (+) and term. 2 (-).
Switch on ignition.

Voltmeter must indicate a voltage of ≥ 10 V.

Voltage correct?

no

Disconnect trigger-box plug, ignition-distributor plug and timing advance unit plug.

Connect ohmmeter to each of the following in turn.

1. <u>Ignition-distributor connector</u>	<u>Ignition timing unit plug</u>
--	----------------------------------

Term. 4	and	term. 4
Term. 2	and	term. 2

Ohmmeter must indicate approx. 0Ω (continuity) in each case. Eliminate open circuit.

2. <u>Ignition timing unit plug</u>	<u>Trigger-box plug</u>
-------------------------------------	-------------------------

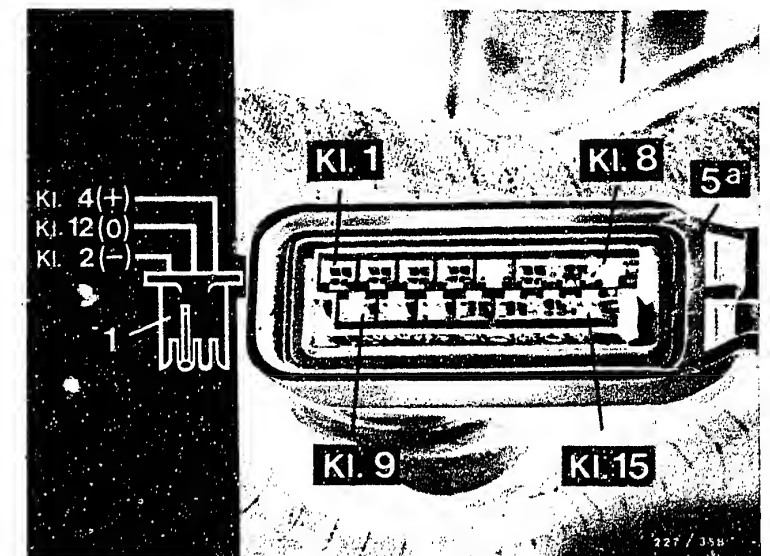
Term. 1	and	term. 3
term. 3	and	term. 4

Ohmmeter must indicate approx. 0Ω (continuity) in each case. Eliminate open circuit.

If there was no open circuit in Points 1 and 2, replace ignition timing unit.

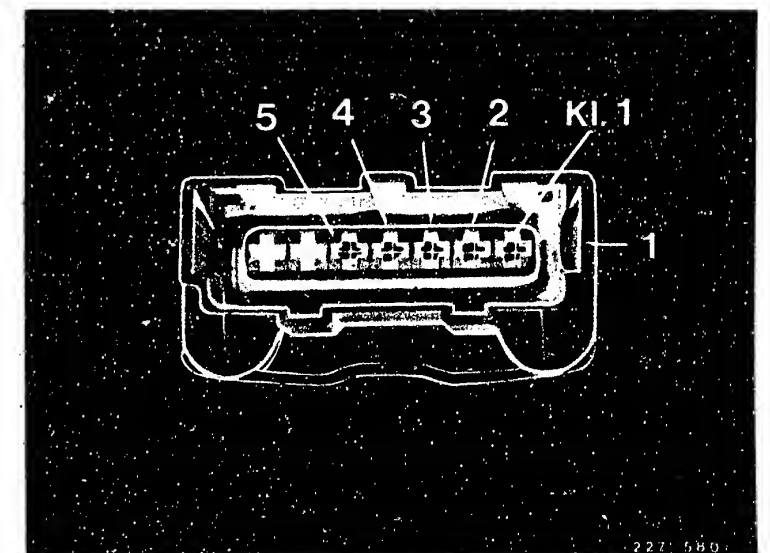
yes

Continued on D 6 / D 7



1 = Ignition-distributor connector
5a = Ignition timing unit plug

1 = Trigger-box plug



D4

Trouble-shooting program

Opel



D5

Trouble-shooting program

Opel



yes

Test operation of pulse generator.

Trigger-box plug, ignition-distributor plug and timing advance unit plug connected.
Push back rubber sleeve of ignition-distributor connector.

Connect oscilloscope as per operating instructions with program switch in "special" position.

For example, MOT 201:

Red clip with test prod to ignition-distributor connector term. 12 (measured signal).

Black clip to ground.

Start engine.

The oscilloscope must display rectangular pulses. See lower illustration.

Rectangular pulse present?

no

Replace pulse generator/ignition distributor.

yes

Continued on D 8 / D 9

D6

Trouble-shooting program

Opel



D7

Trouble-shooting program

Opel



Kl. 4(+)

Kl. 12(0)

Kl. 2(-)

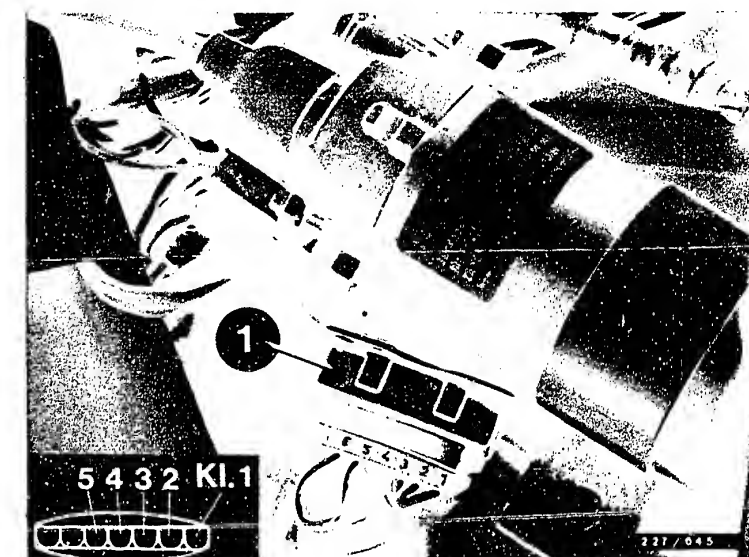
1

227 / 359

1 = Ignition-distributor connector

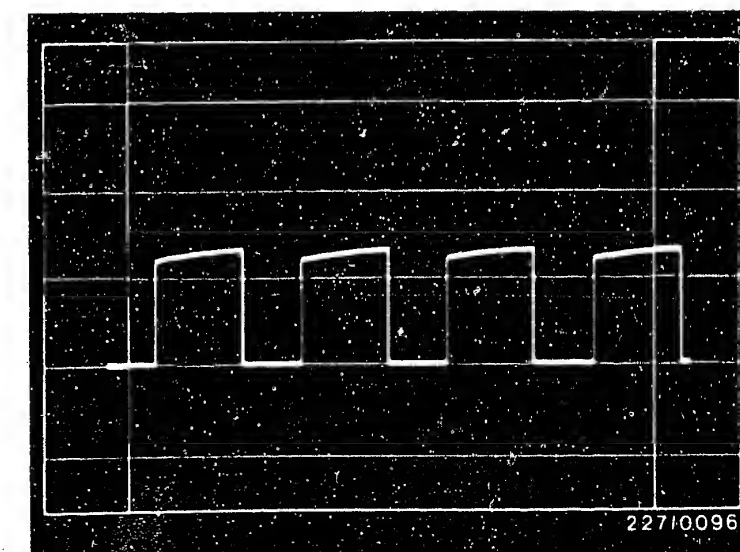
Rectangular pulse

227/0096

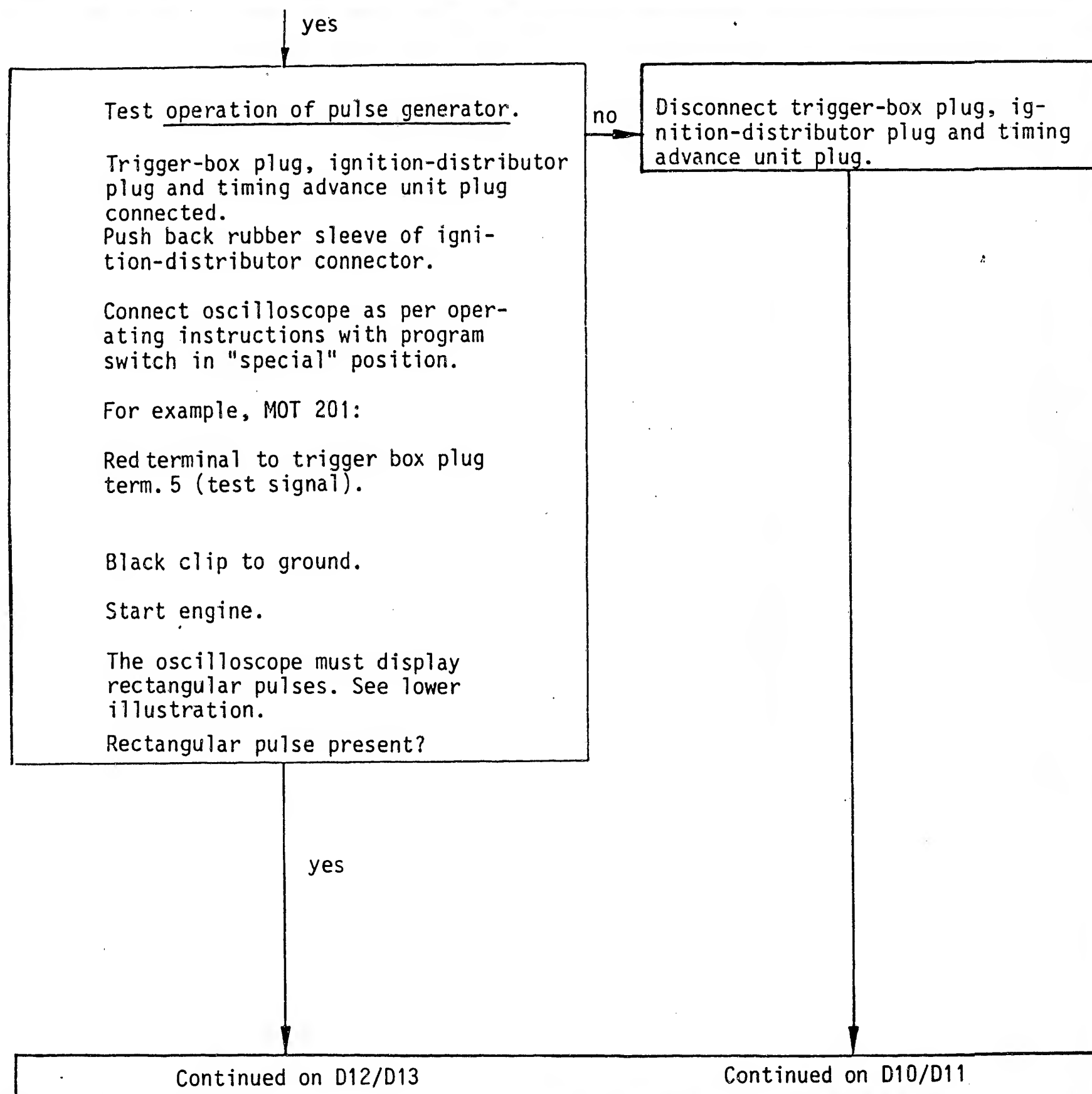


1=Trigger-box plug

Rectangular pulse



227/0096



D8

Trouble-shooting program
Opel



D9

Trouble-shooting
Opel



Continued

Connect ohmmeter consecutively to:

<u>Ignition-distributor</u> <u>connector</u>		<u>Ignition timing</u> <u>unit plug</u>
---	--	--

Term. 12 and term. 12

<u>Ignition timing</u> <u>unit plug</u>		<u>Trigger-box</u> <u>plug</u>
--	--	-----------------------------------

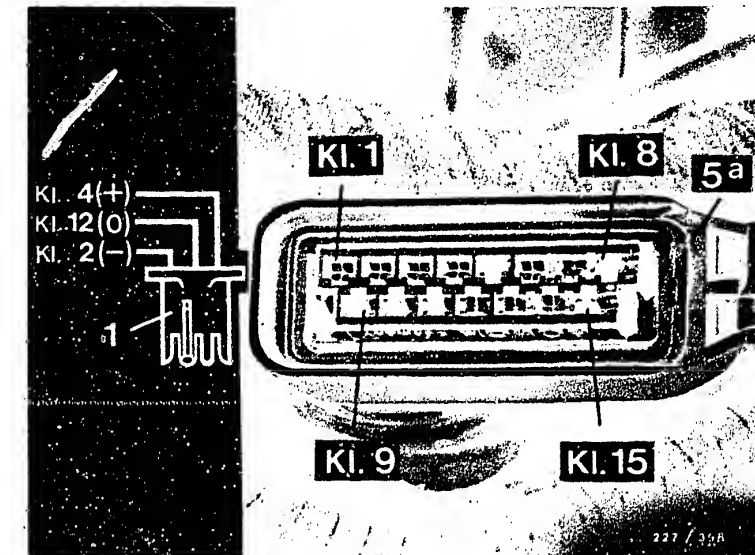
Term. 13 and term. 5

Ohmmeter must indicate approx. 0 Ω
(continuity) in each case. Eliminate open circuit.

If there was no open circuit, replace ignition timing unit.

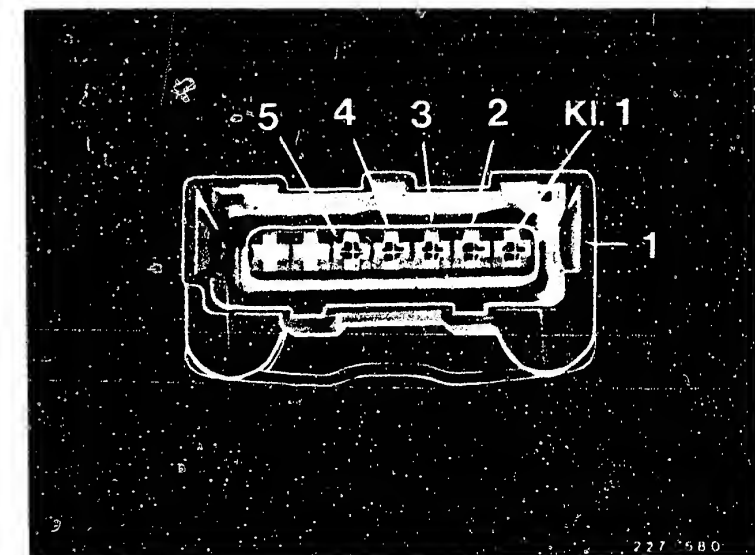
yes

Continued on D 12 / D 13



1 = Ignition-distributor connector
5a = Ignition timing unit plug

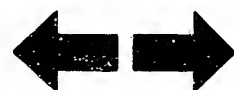
1 = Trigger-box plug



D10

Trouble-shooting program

Open



D11

Trouble-shooting program

Open



yes

Test ignition coil.

Visual examination:

Remove protective cap from ignition coil and check whether plug (see picture) is in position and whether any sealing compound has escaped.

Electrical test:

Ignition coil primary (term. 15 and term. 1) $0,6 \dots 1,0 \Omega$
(Allow for resistance of test lead). Ignition coil secondary (terminals 1 and 4)
 $6,4 \dots 11,1 \text{ k} \Omega$.

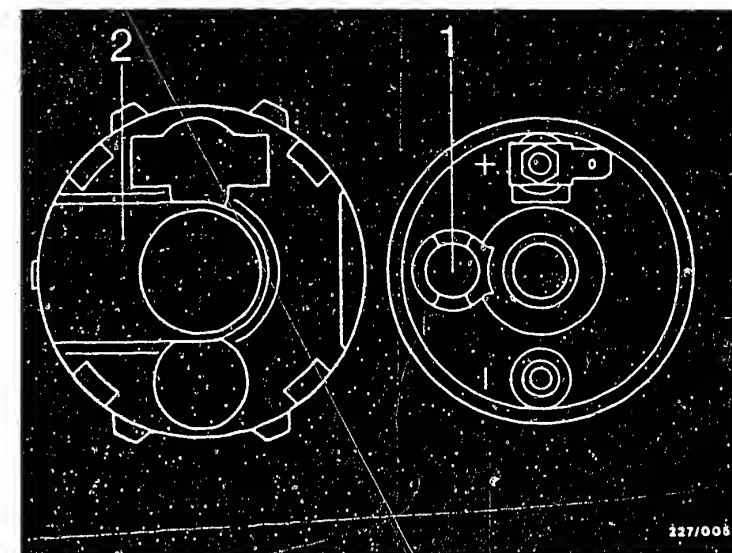
Plug in position? No sealing compound escaped?

Resistance value O.K.?

no

1. If plug is not in position and/or sealing compound has escaped, replace trigger-box, ignition timing unit and ignition coil.

2. If resistance values are not O.K., replace ignition coil.



1 = Plug
2 = Protective cap

yes

Replace trigger box.

Test completed.

Tests from B9 not necessary.

Note:

If customer complaint is not yet remedied, then check for further possible faults in the fuel system, or engine not mechanically O. K.

D12

Trouble-shooting program

Opel



D13

Trouble-shooting program

Opel



After-sales Service

Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

22

Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

BOSCH

Geschäftsbereich Kfz-Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

N1

Technical Bulletin

Opel

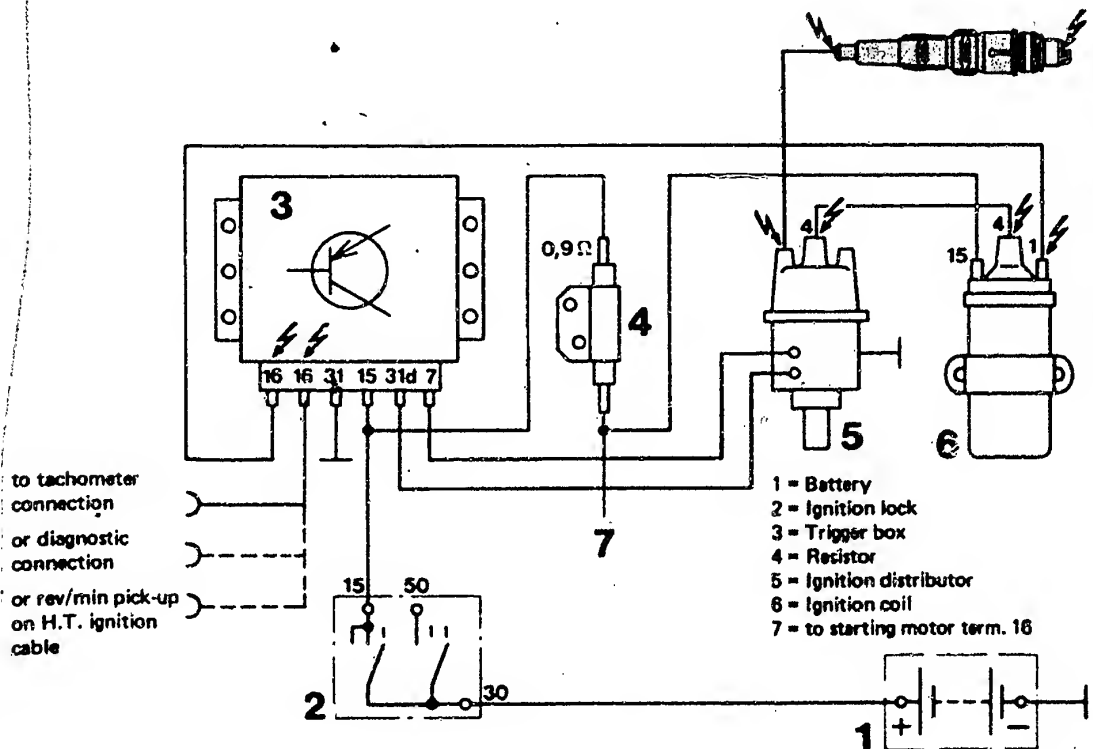


In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram



After-sales Service

Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

EFFECTS OF ELECTRICAL AND ELECTRONIC
SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En

1.1981

e.g. ignition systems, Jetronic, Motronic, ABS

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency). Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

BOSCH

Geschäftsbereich KM, Kundendienst, Kfz-Ausrüstung.
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

N3

Technical Bulletin

Opel



We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.



After-sales Service

Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party

BREAKERLESS TRANSISTORIZED IGNITION SYSTEM

22

Warranty note

VDT-I-227/103 En
3.1979

Hybrid construction trigger boxes
0 227 100 100 for ignition distributor
with Hall generator (TCI-h)
0 227 100 102 for ignition distributor
with induction-type
pulse generator (TCI-i)

Apart from the well-known TCI trigger boxes 0 227 100 0.., trigger boxes of hybrid construction have been fitted as standard since 9.78 (Fig. 1).

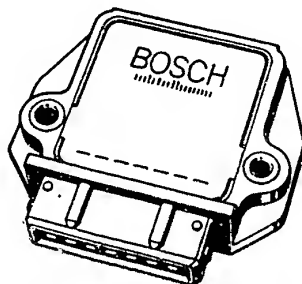


Fig. 1

Warranty procedure

If the complaints are justified, all these hybrid trigger boxes are to be sent, along with completed warranty documents, to your authorized representative for forwarding to the following address:

ROBERT BOSCH GMBH
KH/LAV - Auspackraum

zur Weiterleitung an K1/VAK 21

D-7000 Stuttgart 30

This instruction remains valid until further notice.

BOSCH

Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

N5

Technical Bulletin

Opel



After-sales Service

Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party

NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En

1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	-----	Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I* (TCI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
	TSZ-H	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized ignition	TZ-I* (TI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in Hybrid technique)	TZ-H* (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)

BOSCH

Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany.
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

N6

Technical Bulletin

Opel



Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Breakerless semiconductor ignition with or without knock control	EZ EZ-K	- K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributorless ignition with or without knock control	VZ VZ-K	- K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).



After-sales Service

Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

INCORRECT DISPLAY OF ROTATIONAL SPEED AND
DWELL ANGLE ONLY WITH TRIGGER BOXES
0 227 100 ... (TCI-i, TCI-h) WITH CURRENT
LIMITATION

VDT-I-Gen. 030 En
6.80
Supersedes Ed. 3.80

For additional information see VDT-I-Gen. 032 En

1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT 001.00}	Rotational-speed	KTE 001.00
001.01}	display O.K. with these	001.02
001.02	testers	001.03
001.04		
002.00		

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild- ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan-Datsun	(Hitachi ignition system)
Fiat	(Delco ignition system)	Peugeot	(Bosch ignition system)
Ford	(Delco ignition system)	VW	(Bosch/Fairchild ignition system)
General- Motors	(HEI-ignition system)	Bosch transistorized ignition system for retrofitting 0 227 100 920	

BOSCH

Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
C by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

N8

Service Information

Opel



2. Test instructions

2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min⁻¹ to 1200 min⁻¹).

It is, however, possible to attain correct rot.-speed measurements as follows:

Connect a ballast resistor of 0.9 or 1.0 Ohm (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

Suggestion for user manufacture

Required parts:

- 1 ballast resistor 0.9 Ohm
- or
- 1 ballast resistor 1.0 Ohm
- 2 blade receptacles e.g.
- approx. 0.2 m cable, 1.5 mm² e.g.
- 2 insulated clips

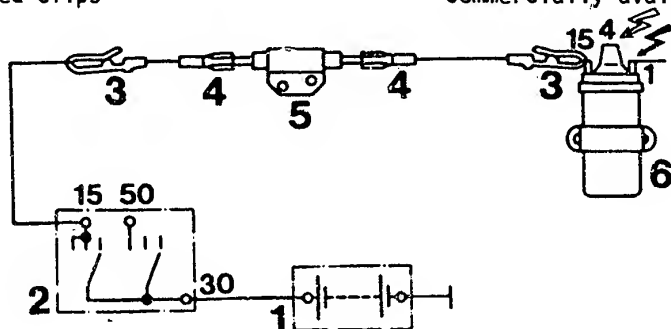
Part No. 0 227 900 002

Part No. 0 227 900 101

Part No. 1 901 355 881

Part No. 6 210 150 150

Commercially available



- 1 = Battery
- 2 = Ignition switch
- 3 = Clips

- 4 = Blade receptacle
- 5 = Ballast resistor
- 6 = Ignition coil

⚡ approx. 400 V

⚡ approx. 25 V

2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.



After-sales Service

Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

MOTORTESTER CONVERSION

Incorrect display of rotational speed,
dwell angle and ignition point
only with trigger boxes
0 227 100 ... (TCI-i, TCI-h) with current
limitation

VDT-I-Gen. 032 En
6.80

For additional information see VDT-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268
268 S 10
269
214 B
AE 2000

1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

BOSCH

Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

N10

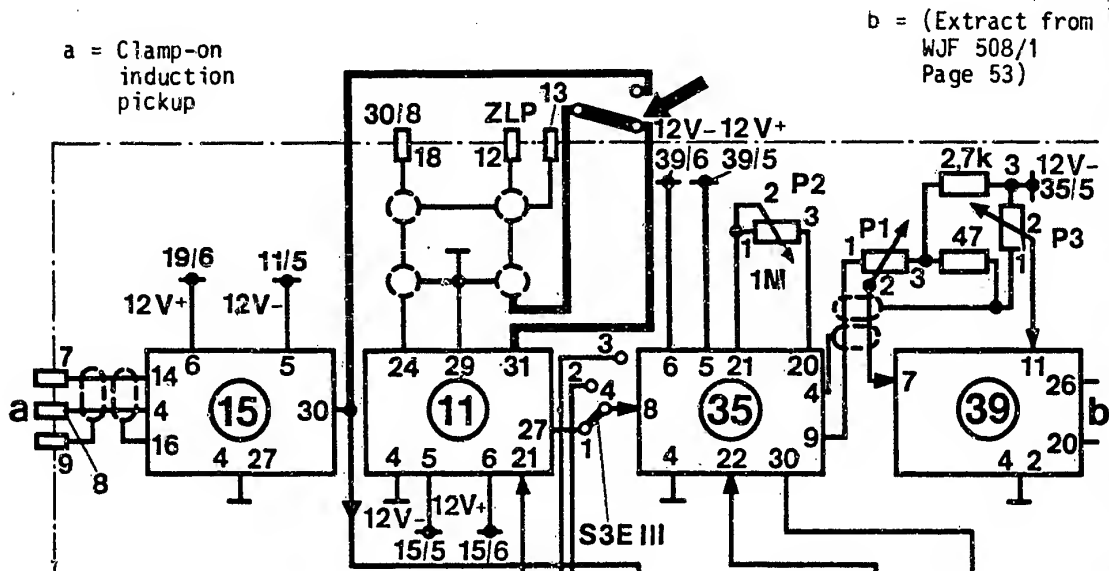
Service Information

Opel



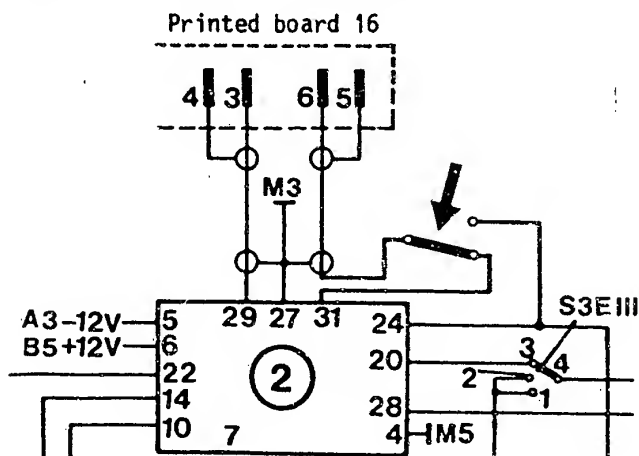
Remove the line of the ZLP* from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.

* ZLP = timing light



EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.



By fitting the switch with change-over contact in the front panel of the motor-tester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly: e.g. "standard" - "current limitation".

These conversion measures have already been published in the K7 information sheet KJF 28/7911.

4. Test instructions

4.1 Standard ignition systems

Switch position: "standard"

All other tester connections as per operating instructions.

4.2 Ignition systems with current limitation

Switch position: "current limitation"

In order to trigger the timing light, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.



After-sales Service

Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party

TESTS ON ELECTRONIC IGNITION SYSTEMS
(TCI, TZ)
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En
3.1981

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscillograph.

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

BOSCH

Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

N13

Service Information

Opel



TABLE OF CONTENTS

<u>Section</u>	<u>Coordinates</u>
Structure of microfiche	A 1
1. Special features	A 2
2. Test specifications	A 2
3. Electrical terminal diagram	A 3
4. Installation position of components	A 5
5. Necessary testers, aids	A 8
6. Danger of accident on electronic ignition systems	A 9
7. Incorrect indication of engine speed, dwell angle and ignition timing	A 13
8. Important vehicle information	A 14
9. Trouble-shooting	B 1
Direct trouble-shooting with trouble- shooting chart	B 3
Detailed trouble-shooting program if primary signal/ignition spark present ...	B 7
Detailed trouble-shooting program if primary signal/ignition spark <u>not</u> present	D 1
Technical Bulletin (danger of accident)	N 1
Technical Bulletin (influence of electrical and electronic systems on heart pacemakers)	N 3



Table of contents (continued)

<u>Section</u>	<u>Coordinate</u>
Technical Bulletin (warranty note)	N 5
Technical Bulletin (new designations for ignition systems)	N 6
Motor Vehicle Service Information (incorrect indication of engine speed and dwell angle)	N 8
Motor Vehicle Service Information (motortester conversion)	N 10
Motor Vehicle Service Information (tests on electronic ignition systems)	N 13

© 1985 Robert Bosch GmbH
Automotive Equipment - After-Sales Service,
Department for Technical Publications KH/VDT,
Postfach 50, D-7000 Stuttgart 1

Published by: After-Sales Service, Department for
Training and Technology (KH)VSK). Press date: 5.1985

Please direct questions and comments concerning the
contents to our authorized representative in your
country.

This publication is only for the use of the Bosch
After-Sales Service Organization, and may not be passed
on to third parties without our consent.

Microfilmed in the Federal Republic of Germany.
Microphotographié en République Fédérale d'Allemagne.

